

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. Contract ID Code Cost-Plus-Fixed-Fee	Page 1 Of 13
2. Amendment/Modification No. P00008		3. Effective Date 2003OCT30		4. Requisition/Purchase Req No. SEE SCHEDULE	
5. Project No. (If applicable)					
6. Issued By TACOM WARREN BLDG 231 AMSTA-AQ-ABGD PAUL VESELENAK (586)574-7632 WARREN, MICHIGAN 48397-5000 HTTP://CONTRACTING.TACOM.ARMY.MIL EMAIL: VESELENP@TACOM.ARMY.MIL		Code W56HZV		7. Administered By (If other than Item 6) DCMA BOSTON 495 SUMMER STREET BOSTON, MA 02210-2138	
				Code S2206A	
				SCD C PAS NONE ADP PT HQ0337	
8. Name And Address Of Contractor (No., Street, City, County, State and Zip Code) TALKING LIGHTS LLC 28 CONSTITUTION ROAD BOSTON, MA. 02129-2008				<input type="checkbox"/> 9A. Amendment Of Solicitation No. <input type="checkbox"/> 9B. Dated (See Item 11) <input checked="" type="checkbox"/> 10A. Modification Of Contract/Order No. DAAE07-99-C-L068 <input type="checkbox"/> 10B. Dated (See Item 13) 1999SEP29	
TYPE BUSINESS: Other Small Business Performing in U.S.					
Code 1HZA4		Facility Code			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendments: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. Accounting And Appropriation Data (If required) NO CHANGE TO OBLIGATION DATA					
13. THIS ITEM ONLY APPLIES TO MODIFICATIONS OF CONTRACTS/ORDERS					
KIND MOD CODE: G It Modifies The Contract/Order No. As Described In Item 14.					
<input type="checkbox"/> A. This Change Order is Issued Pursuant To: The Changes Set Forth In Item 14 Are Made In The Contract/Order No. In Item 10A.					
<input type="checkbox"/> B. The Above Numbered Contract/Order Is Modified To Reflect The Administrative Changes (such as changes in paying office, appropriation data, etc.) Set Forth In Item 14, Pursuant To The Authority of FAR 43.103(b).					
<input checked="" type="checkbox"/> C. This Supplemental Agreement Is Entered Into Pursuant To Authority Of: MUTUAL AGREEMENT					
<input type="checkbox"/> D. Other (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input checked="" type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the Issuing Office.					
14. Description Of Amendment/Modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)					
SEE SECOND PAGE FOR DESCRIPTION					

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. Name And Title Of Signer (Type or print)		16A. Name And Title Of Contracting Officer (Type or print) JOHN M. HOPFNER HOPFNERJ@TACOM.ARMY.MIL (586)574-7070	
15B. Contractor/Offeror _____ (Signature of person authorized to sign)	15C. Date Signed	16B. United States Of America By _____ /SIGNED/ (Signature of Contracting Officer)	16C. Date Signed 2003OCT30

NSN 7540-01-152-8070

PREVIOUS EDITIONS UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-83)

Prescribed by GSA FAR (48 CFR) 53.243

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 2 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

SECTION A - SUPPLEMENTAL INFORMATION
CONTRACT FOR: Light Communication Network

PRIOR AMOUNT OBLIGATED: \$1,427,300.00
AMOUNT OBLIGATED THIS ACTION: \$ 0.00
TOTAL AMOUNT OBLIGATED: \$1,427,300.00

1. This is a bilateral, no cost modification.
2. The purpose of this Modification P00008 is to make the following changes in the contract:
 - a) Delete the requirement for a joint demonstration with Pathfinder listed in C.8.3 and replace it with a demonstration which will be held by 31 May 04 at some other government installation, which will be named later.
 - b) Extend the contract completion date from the current completion date of 30 Oct 03 to the new completion date of 31 May 04.
3. The reason for the above changes is the inability to arrange for a joint demonstration with Pathfinder and the need for enough time to plan and conduct another, similar demonstration at a government installation.
4. The following revisions are made to the contract to implement the changes listed in Paragraph 2 above:
 - a) The Section B Schedule Page is changed to list the new completion date of 31 May 04 for CLIN 0007AA.
 - b) Provision C.8.3 is changed to delete all reference to the Pathfinder demonstration and to replace it with references to a similar demonstration which will be held at a government installation and at a time, yet to be determined.
 - c) Provision C.8.4.1 is changed to require that the demonstration listed in C.8.3 must be conducted before the new contract completion date of 31 May 04.
 - d) Provision C.8.4.3 is changed to require the submission of the draft Final Report by the revised date of 15 Apr 04 and that the Final Report be submitted by 31 May 04.
 - e) Provision F.3 is changed to delete the current contract completion date of 30 Oct 03 and replace it with the new contract completion date of 31 May 04.
5. The effective date of this Modification P00008 is 30 Oct 03.
6. The total contract amount remains unchanged at \$1,427,300.00.
7. All other terms and conditions of Contract DAAE07-99-C-L068, as previously modified, remain unchanged.

*** END OF NARRATIVE A 008 ***

Name of Offeror or Contractor: TALKING LIGHTS LLC

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT									
	SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS													
0007	<div>SERVICES LINE ITEM</div> <div>NOUN: MINIATURIZED SMART MARKERS</div> <div>SECURITY CLASS: Unclassified</div>													
0007AA	<div>SERVICES LINE ITEM</div> <div>PRON: E112C335EH PRON AMD: 01 ACRN: AH</div> <div>AMS CD: 665502M4055</div> <div>Inspection and Acceptance</div> <div>INSPECTION: Destination ACCEPTANCE: Destination</div> <div>Deliveries or Performance</div> <div><table><tr><td>DLVR SCH</td><td></td><td>PERF COMPL</td></tr><tr><td><u>REL CD</u></td><td><u>QUANTITY</u></td><td><u>DATE</u></td></tr><tr><td>001</td><td>0</td><td>31-MAY-2004</td></tr></table><div>\$ 150,000.00</div></div>	DLVR SCH		PERF COMPL	<u>REL CD</u>	<u>QUANTITY</u>	<u>DATE</u>	001	0	31-MAY-2004				\$ _____ 150,000.00
DLVR SCH		PERF COMPL												
<u>REL CD</u>	<u>QUANTITY</u>	<u>DATE</u>												
001	0	31-MAY-2004												

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 4 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT
C.4 SCOPE OF WORK FOR ADVANCED MARKING DEMONSTRATION SYSTEM

C.4.1 Scope of Work Overview

The contractor, Talking Lights, will conduct a demonstration at Ft. Leonard Wood, MO in Aug 01 to demonstrate the optical receiver, cabling and software being developed under this contract per Provision C.4.2 below. The contractor will also conduct a follow-on demonstration at Ft. A.P. Hill, VA in Dec 01, to provide more intensive testing of the light communication system as described in Provision C.4.2 below. This demonstration will involve the integration and combined use of currently separate technologies that were developed under this contract with the Talking Lights Company and under another Phase II SBIR contract with Pathfinder Systems, Inc. To support this planned demonstration at Ft. A.P. Hill the contractor shall be responsible for construction of the physical markers and the marker communication system that will interface with a vehicular navigation system (including displays, controls, sensors, and navigation processing) developed by Pathfinder under their contract with the government. The resulting integrated demonstrator system shall have the goal of providing an operator of a vehicle the ability to drive through breached lanes and around physical obstacles using the demonstrator technology rather than relying solely on the driver's normal eyesight.

C.4.2 Task Overview

Talking Lights shall be responsible for making their best effort to meet the specific overall goal of developing and manufacturing twelve (12) additional markers capable of functioning as either Smart Markers or Master Markers. The contractor shall also be responsible for developing the network software necessary to enable the networked markers to communicate and coordinate with the Pathfinder vehicle navigation system which will be demonstrated in Dec 01 at Ft. A.P. Hill. This overall effort shall include the following specific tasks listed below.

C.4.2.1 Task 1 - Manufacture, Development & Shipment of Markers

Talking Lights shall manufacture, test, and furnish a total of at least twelve (12) markers, with all 12 capable of functioning as either Smart Markers or Master Markers. These lights shall have the capability of establishing a Combat Communications Network and shall be made available to the government by Dec 01, for the demonstration scheduled at Ft. A.P. Hill. Once this demonstration has been completed the contractor will be permitted to retain the use of these Markers for the remainder of the performance under this contract. However, the contractor shall submit a written request via email to both the PCO and to the COTR at least sixty (60) days before the completion of the contract to ask where the government would like these markers shipped to at the time of contract completion. The government will respond within thirty (30) days before completion of the contract and provide shipping instructions for these markers. The contractor will be responsible for shipping these markers to the destinations provided by the government no later than the date of contract completion. The markers shall be packaged and packed in accordance with Clause D.1 and marked in accordance with Clause D.2.

C.4.2.2 Task 2 - Development and Delivery of PC and Software

Talking Lights shall provide the following services and hardware:

- (i) manufacture, test, and provide an optical receiver which will be rugged enough to remain operable for a period not to exceed three (3) days, when mounted in or on the Pathfinder Systems vehicle when the vehicle is stored and driven outdoors in off-road terrain and during weather conditions which could include rain, mist, or fog.
- (ii) cabling to attach this optical receiver to Pathfinder's Sensor Kit
- (iii) software to allow Pathfinder's Navigation Processor the ability to read and process the information being transmitted by the optical network This information shall include: the coordinates of the markers in the Combat Communications Network plus other information stored in the markers such as "mock" hazardous material information, "mock" Bridge Military Load Classifications, and any other information determined by Talking Lights to be useful in the battlefield of the future.

Talking Lights shall provide the optical receiver, cabling, and software described in this Provision C.4.2.2 to the government by the scheduled Aug 01 demonstration at Ft. Leonard Wood, MO. The contractor shall retain possession of this cabling and software after the Aug 01 demonstration at Ft. Leonard Wood, MO so that it can be used in performance of the balance of this contract. However, the contractor shall submit a written request via email to both the PCO and to the COTR at least sixty (60) days before the completion of the contract to ask where the government would like this optical receiver, cabling, and software to be shipped at the time of contract completion. The government will respond within thirty (30) days before completion of the contract and provide shipping instructions to the contractor Talking Lights shall be responsible for shipping the optical receiver, cabling and software to the destination(s) specified by the government no later than the date of contract completion. The optical receiver, cabling and software shall be packaged and packed in accordance with Clause D.1 and marked in accordance with Clause D.2.

C.4.2.3 Task 3 - Participation with Pathfinder in Demonstration

Talking Lights shall provide a minimum of two (2) support personnel to participate in the trial and demonstration of the Combat Communications System, the Pathfinder GTVS and the combined operation of both systems, scheduled for Dec 01 at Ft. A.P. Hill, VA. This participation by Talking Lights shall include the following:

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 5 of 13
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Name of Offeror or Contractor: TALKING LIGHTS LLC

- (i) setting up the Talking Lights simulated breach minefield
- (ii) confirming that the Talking Lights network is fully operational
- (iii) confirming that the Pathfinder Navigation System is processing the network's information correctly
- (iv) performing any incidental trouble-shooting or repairs to the Combat Communications Network or any of its components that may become necessary during conduct of the demonstration

C.4.2.4 Task 4 - Design of Hand Held Computer-Related Software and Hardware

The contractor shall design the hardware and software necessary to allow a handheld computer to communicate with the Smart Markers and Master Markers to meet the following specific performance goals:

- (a) A user with a handheld computer will be able to communicate with the Smart Marker or Master Markers optically at a minimum distance of 2 meters with a goal of 20 meters.
- (b) The user will be able to turn the Smart Markers or Master Marker off or on remotely and will be able to receive, store, and recall messages transmitted from the markers.

C.4.2.5 Task 5 - Communicate with Prototype Smart Mines

The contractor shall design, build, and demonstrate for the government at the contractor's facility the capability to communicate with one or more prototype Smart Mine(s). The contractor shall attempt to meet the following specific performance goals as part of this task:

- (a) Fabricate at least one and preferably two prototype Smart Mine(s)
- (b) Fabricate appropriate hardware and software and integrate them into the prototype smart mine(s) and fabricate appropriate power electronic hardware and software to allow standard automotive headlights to communicate with the prototype smart mine(s) at a minimum distance of 5 meters and a goal of at least 30 meters in bright sunlight, with no visible flicker from the headlights which can be easily seen by the human eye while this communication is taking place.

C.4.2.6 Task 6 - Progress Reports

The contractor shall submit progress reports every 60 days, in accordance with Data Item A001, Exhibit A, while performing the tasks set forth in Clause C.4. These progress reports will be combined with the progress reports due under Option 1, and with any progress reports due under Option 2, if Option 2 is exercised by the government, so that only one progress report is submitted by the contractor at any one time describing all the work being currently performed on the contract.

C.5 OPTION 1

Under Option 1, which was exercised by the government by Modification P00005, pursuant to the Section H clause entitled "Exercise of Option", the contractor shall perform the following tasks to the best of his ability:

C.5.1 Fabricate & Test Hand Held Computer-Related Software and Hardware

Talking Lights shall fabricate, test, and demonstrate the hand held computer hardware and related software.

C.5.1.1 Computer-Related Software and Hardware Demonstration

The contractor will demonstrate the ability of the Computer-Related Software and Hardware to communicate with Smart Markers and Master Markers, turn on and off the Markers and store and recall messages from the Markers. This demonstration will occur at Ft. A.P. Hill during the demonstration taking place in Dec 01, as outlined in Provisions C.4.1 and C.4.2.3. The contractor will retain possession of this hand held computer hardware and related software while the contract is being performed. However, the contractor shall submit a written request via email to both the PCO and the COTR to request shipping instructions for this computer-related software and hardware no later than sixty (60) days before the end of the contract. The government will respond no later than thirty (30) days before the end of the contract and provide such shipping instructions. The contractor will be responsible for shipping this computer(s) to the destination(s) specified by the government no later than the contract completion date. This computer(s) will be packaged and packed in accordance with Provision D.1 and marked in accordance with Provision D.2.

C.5.1.2 Smart Approach Marker Demonstration (DELETED)

C.5.2 PROGRESS REPORTS - Option 1

The contractor shall submit progress reports every 60 days during the performance period for Option 1, in accordance with the Section F

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 6 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

clause entitled "Option Deliverables" and Data Item A001, in Exhibit A. These progress reports shall, at a minimum, summarize progress to date on Option 1, including any significant accomplishments, problems, or issues. These progress reports shall also report both the total costs incurred to date during performance of Option 1, and the specific costs incurred since the last progress report was submitted. No progress report is due when the final report for Option 1 is due (see C.5.3). The progress reports for both Option 1 and Option 2 (if both options are exercised and are being performed concurrently) and for any work being conducted under the basic contract, may be combined into one consolidated progress report every 60 days with reports on any work remaining under the basic contract or on Option 2.

C.5.3 FINAL REPORT - Option 1

Talking Lights shall prepare and submit a draft Final Technical Report by 5 Jan 03 documenting and analyzing the developments and trials conducted during performance of the basic work specified in Provision C.2.4 above and also the work conducted under Option 1, in accordance with Provision C.5, pursuant with Data Item A002, Exhibit A of the contract. The government will have fifteen (15) days to provide comments regarding this draft Final Report. The contractor will submit the Final Technical Report by 16 Feb 03, in accordance with Data Item A002, Exhibit A. However, if either Option 2 and/or Option 3 is exercised (see the Section H option provision and Provisions C.6.3 and C.7.4 below) is exercised by the government in accordance with the terms of the Section H provision entitled "Exercise of Option" than a draft Final Report for Option 1 and the basic contract will be combined with the draft Final Report submitted for Options 2 and/or Option 3 and will not be submitted until 1 Aug 03. The government will have 15 days to provide comments to any draft Final Report for government review and the contractor will submit the Final Technical Report by 16 Sep 03, in accordance with Provision C.6.3 (for Option 2) and Provision C.7.4 for Option 3), the Section H "Exercise of Option" provision and Data Item A002, Exhibit A.

C.6 Option 2

If Option 2 is exercised by the government, pursuant to the Section H clause entitled "Exercise of Option", the contractor shall perform the tasks listed below.

C.6.1 Develop Enhanced Software and Hardware for the Combat Communication Network

The objective of this task is to develop enhanced software and hardware for the Combat Communication Network which is directed towards meeting the following goals:

- a) Develop enhanced software and hardware which will allow a network of up to 38 Master and Smart Markers to communicate simultaneously in a variety of geometrical and topological arrangements and which also allow for greater ease and reliability of setup and use of the network so that a response rate of 90%, or better, is achieved.
- b) Develop increased capability in individual Smart Markers so that they can function as an electronics platform to:
 - (1) house sensors, such as chemical agent sensors
 - (2) store data shared in the network
 - (3) communicate information to users at distances beyond 2 km
- c) Develop both the Smart Markers and the Master Markers so that they can represent a multi-use platform for the housing and deployment of a number of different sensors and information gathering devices including Bridge Military Load Classification (MLC) Beacons, identification of friend or foe, wind speed, air quality, and chemical agent detection. The goal would be to have both Smart Markers and Master Markers perform the above functions on a stand-alone basis or as part of the Combat Communications Network.

C.6.2 Progress Reports - Option 2

The contractor shall submit progress reports every 60 days during the performance period for Option 2, in accordance with the Section F clause entitled "Option Deliverables" and Data Item A001. These progress reports shall, at a minimum, summarize progress to date on Option 2, including any significant accomplishments, problems, or issues. These progress reports shall also report both the total costs incurred to date, during performance of Option 2, and the specific costs incurred since the last progress report was submitted. No progress report is required at the end of Option 2 when the Final Report is due. The progress reports due under Option 2 may be combined with the progress reports due under the basic contract, those due under Option 1, and those due under Option 3, if Option 3 is exercised by the government.

C.6.3 Final Report - Option 2

If Option 2 is exercised in accordance with the Section H clause entitled "Exercise of Option" the contractor shall prepare and submit a draft Final Technical Report by 1 Aug 03 documenting and analyzing the research, testing, developments and trials conducted during Option 2, and also for the work previously performed under the basic contract and Option 1, and under Option 3, if Option 3 is also exercised by the government. The government will have 15 days to review and provide comments regarding this draft Final Report. The contractor shall submit the Final Technical Report by 16 Sep 03, in accordance with Clause F.4.2 and Data Item A002, Exhibit A.

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 7 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

C.7 Option 3

If Option 3 is exercised by the government, pursuant to the Section H clause entitled "Exercise of Option", the contractor shall perform the tasks listed below.

C.7.1 Option 3 Tasks

The contractor shall develop improved networking software to allow greater operational freedom and flexibility in positioning, setup and usage of Smart Markers and the Combat Communications Network including:

(1) Rendering Smart Markers capable of communication in a network environment when the markers are placed into the ground at angles ranging from +/- 25 degrees from perpendicular.

(2) Obtaining vehicle to marker communication when the vehicle is moving at speeds of up to 25 miles per hour.

C.7.2 Option 3 - Software Deliverables

The contractor shall deliver the following software by 16 Sep 03, at the completion of Option 3:

- a) Protocol specification for the software.
- b) Microcontrollers with custom firmware containing the software which has been developed. The contractor shall deliver sufficient microcontrollers for a 38 light network.

The contractor shall deliver the protocol specification in accordance with the Section F clause entitled "Option Deliverables" and Data Item A003, Exhibit A. The contractor shall provide the microcontrollers in accordance with the Section F clause entitled "Option Deliverables".

C.7.3 Progress Reports - Option 3

The contractor shall submit progress reports every 60 days during performance of Option 3, in accordance with the Section F clause entitled "Option Deliverables" and Data Item A001, Exhibit A. These progress reports shall, at a minimum, summarize progress to date on Option 3, including any significant accomplishments, problems, or issues. These progress reports shall also report both the total costs incurred to date, during performance of Option 3, and the specific costs incurred since the last progress report was submitted. No progress report is due at the end of Option 3 when the Final Report is due. The progress reports due under Option 3 will be combined with those due under the basic contract, Option 1, and Option 2, into a single report.

C.7.4 Final Report - Option 3

If Option 3 is exercised by the government in accordance with the Section H clause "Exercise of Option", the contractor shall prepare and submit a draft Final Technical Report by 1 Aug 03 documenting and analyzing the research, testing, developments and trials conducted during Option 3, in accordance with the Section F clause entitled "Option Deliverables" and Data Item A002, Exhibit A. This draft Final Report will also include a description of all the work conducted under the basic contract, Option 1, and Option 2, if Option 2 has been exercised, plus the work performed under Option 3. The government will have 15 days to comment on the draft Final Report. The contractor shall submit the Final Technical Report by 16 Sep 03, in accordance with the Section F clause entitled "Option Deliverables" and Data Item A002, Exhibit A.

C.8 Design and Manufacture of Miniaturized Markers

The Contractor will design and manufacture at least 3 miniaturized Smart Markers including, at a minimum, 2 (two) Linear Smart Markers and 1 (one) Corner Smart Marker.

C.8.1 Linear Smart Markers (LSM)

C.8.1.1 Linear Communications

Each Linear Smart Marker (LSM) will be able to communicate in a linear fashion with the other Smart Markers. This will mean that starting from any arbitrary point on the circumference of the marker, each LSM will be able to communicate from:

- (i) at least zero to sixty (60) degrees (threshold) with a target objective of zero to ninety (90) degrees;
- (ii) from one hundred eighty (180) degrees to two hundred forty (240) degrees (threshold) with a target objective of one hundred eighty (180) degrees to two hundred seventy (270) degrees.

Each LSM will have a permanent visible mark on its exterior casing, to enable it to be emplaced and aligned for communication with the

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 8 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

other markers in a networked configuration, as further described in Paragraph C.8.1.5 below.

C.8.1.2 Range

Each LSM will be able to communicate with other Smart Markers at a minimum range of 3 meters in bright sunlight (threshold) with a target objective of 20 meters.

C.8.1.3 Visible Signal

Each LSM will have the capability to generate a blinking visible signal which is able to be detected by unaided human vision in bright sunlight at a minimum range of 30 meters (threshold) with a target objective of 200 meters. The LSM's blinking visible signal shall be able to be seen from all directions on the horizon and +/- 10 degrees from the horizon. Each LSM shall have different colored visible lights to distinguish the four quadrants of the visible plane. The blinking visible signal will be able to be turned on and off both by:

- (i) a signal sent from another Smart Marker, and by
- (ii) a signal sent from a handheld computer equipped with the communication capability previously developed under Paragraph C.4.2.4 of this contract.

C.8.1.4 Data Storage

Each LSM will have the capability to accept, store,and retain and transmit a data message. The transmission range will be a minimum of 3 meters (threshold) and a target objective of 20 meters. The quantity of data stored will be a minimum of 100 characters (threshold) and a target objective of 1,200 characters. The data will be transmitted to the Linear Smart Marker and received from the Linear Smart Marker by a handheld computer equipped with the communication capability previously developed under Paragraph C.4.2.4 of this contract.

C.8.1.5 Network

The LSMs will be able to form a network to turn on and off the blinking visible signal and to determine if the integrity of the network has been disrupted.

C.8.1.6 Use by Army Personnel

The contractor shall design and fabricate demonstration LSMs to, at a threshold level, at least be able to be operated by Army field personnel in field trials. The target objective will be for the contractor to harden the demonstration LSMs so that light to moderate rain will not interrupt or impair their operation. The contractor will prepare and provide instructions for use and operation of the LSMs (both alone and when networked with other Smart Markers) at the time the LSMs are delivered per Paragraph C.8.4.

C.8.2 Corner Smart Markers

C.8.2.1 Corner Communications

The Corner Smart Marker (CSM) will be able to communicate in an angular fashion with other Smart Markers. This will mean that starting from an arbitrary point on the circumference of the Corner Smart Marker (CSM), the CSM will be able to communicate from at least:

- (i) zero to sixty (60) degrees (threshold) with a target objective of zero to ninety (90) degrees; and
- (ii) ninety (90) degrees to one hundred fifty (150) degrees (threshold) with a target objective of ninety to one hundred eighty (180) degrees.

Each CSM will have a permanent visible mark on its exterior casing, to enable it to be emplaced and aligned for communications with the other markers.

C.8.2.2 Range

Each CSM will be able to communicate with other Smart Markers at a minimum range of 3 meters in bright sunlight (threshold) with a target objective of 20 meters.

C.8.2.3 Visible Signal

Each CSM will have the capability to generate a blinking visible signal which is able to be viewed in bright sunlight at a minimum range of 30 meters with a target of 200 meters. The blinking visible signal will be able to be seen from all directions from the CSM. The blinking visible signal shall have different colored visible lights to distinguish the four quadrants of the visible plane. The blinking visible signal will be able to be turned on and off both by:

- (i) a signal sent from another Smart Marker and by

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 9 of 13
---------------------------	---	----------------------------

Name of Offeror or Contractor: TALKING LIGHTS LLC

(ii) a signal sent from a handheld computer equipped with the communication capability previously developed under Paragraph C.4.2.4 of this contract.

C.8.2.4 Data Storage

Each CSM will have the capability to accept, store and retain and transmit a data message. The transmission range will be a minimum of 3 meters (threshold) and a target objective of 20 meters. The quantity of data stored will be a minimum of 100 characters (threshold) and a target objective of 1,200 characters. The data will be transmitted to and received from the CSM by a handheld computer equipped with the communication capability previously developed under Paragraph C.4.2.4 of this contract.

C.8.2.5 Network

Each CSM will be able to form a network together with LSMs and other CSMs to turn on and off the visible signal on any CSM and LSM in the network, and to determine if the integrity of the network has been disrupted.

C.8.2.6 Use by Army Field Personnel

The contractor will design and fabricate at least one demonstration CSM to, at a threshold level, at least be able to be operated by Army field personnel in field trials. The target objective will be for the contractor to harden the demonstration CSM(s) so that light to moderate rain will not interrupt or impair CSM operation. The contractor will prepare and provide instructions for use and operation of the CSM(s), (both alone and when networked with other Smart Markers) at the time they are delivered, per Paragraph C.8.4.

C.8.3 Demonstration of the Advanced Marking System

As a part of the additional scope of work identified herein as Paragraph C.8 (including C.8.1, and C.8.2) the government intends to conduct an additional demonstration of an Advanced Marking System. This demonstration will take place at an government installation in the spring of 2004, but before the contract completion date of 31 May 04. Talking Lights will supply the Linear Smart Markers (LSMs) and Corner Smart Marker (CSM).

C.8.4 Deliverables

The contractor shall provide the following deliverables designed and manufactured under paragraph C.8 to the government:

C.8.4.1 LSMs and CSMs

The contractor shall deliver to the government at least two (2) miniaturized Linear Smart Markers (LSMs) and at least one (1) Corner Smart Marker no later than 31 May 04, the contract completion date. The contractor shall prepare and provide instructions for use and operation for both the LSMs and the CSM(s) when they are delivered.

C.8.4.2 Progress Reports

The contractor shall submit progress reports every 60 days, in accordance with Data Item A001, Exhibit A, while performing on paragraph C.8. These progress reports shall be combined with the progress reports being submitted under any options being performed so that there is only one progress report being submitted every 60 days for all the work being performed under this contract.

C.8.4.3 Final Report

The contractor shall prepare and submit a draft Final Report by 15 Apr 04 documenting and analyzing the research, testing, and developments, and trials conducted under the contract, including under any options that have been exercised, in accordance with Data Item A002, Exhibit A. This draft final report shall include all the work conducted under the basic contract and any options that have been exercised so that only one final report for the entire contract is submitted. The government will have 15 days to provide comments to the draft Final Report. The contractor shall submit the Final Technical Report by 31 May 04, in accordance with Data Item A002, Exhibit A.

C.9 OPTION 4 - Additional LSMs and CSMs

Option 4 is an option which, though not currently exercised, may later be exercised unilaterally by the government up to February 26, 2003 under the terms and conditions of the Section H clause entitled "Exercise of Option," subject to the availability of adequate funding. This option, if exercised by the government, would be for additional LSMs and CSMs, as well as for conducting a demonstration and field trial involving these LSMs and CSMs. Option 4 may be exercised by the government even if Options 2 and/or 3 have not been exercised.

C.9.1 Additional LSMs and CSMs

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 10 of 13
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Name of Offeror or Contractor: TALKING LIGHTS LLC

The contractor will manufacture at least six (6) additional Linear Smart Markers (LSMs) and three additional (3) Corner Smart Markers (CSMs) so that a total of eight (8) LSMs and 4 CSMs will be manufactured. This will enable a twelve (12) marker network to be established. The contractor will have 3 months from the time this option is exercised to manufacture the additional 6 Linear Smart Markers and 3 additional Corner Smart Markers.

C.9.2 Demonstration and Field Trial

At a time and place of the Army's reasonable choice within the continental United States but not earlier than three months from the time this option is exercised and not later than 30 Oct 03 the contractor will supply the eight (8) Linear Smart Markers and four (4) Corner Smart Markers to the Army. For a period of one week the contractor will provide two individuals to train and assist Army personnel in using and evaluating the Linear Smart Markers and Corner Smart Markers. At the conclusion of this training Army personnel shall be capable of demonstrating the operational functionability of the smart markers without any contractor assistance.

C.9.3 Deliverables - Option 4

The contractor shall deliver the following deliverables to the government under Option 4:

C.9.3.1 LSMs and CSMs

The contractor shall deliver at least six (6) additional Linear Smart Markers (LSMs) and three (3) additional CSMs to the government by 30 Oct 03.

C.9.3.2 Progress Reports - Option 4

The contractor shall submit progress reports every 60 days during performance of Option 4, in accordance with the Section F provision entitled "Option Deliverables" and Data Item A001, Exhibit A. These progress reports shall, at a minimum, summarize progress to date on Option 4 including any significant problems, issues, and accomplishments. These progress reports shall also include both the total costs incurred to date, during performance of Option 4, and the specific costs incurred since the last progress report was submitted. No progress report is due at the end of Option 4 when the Final report is due. The progress reports due under Option 4 shall be combined with those due under the basic contract and with those due under any other options that have been exercised so only one progress report is submitted every 60 days under this contract.

C.9.3.3 Final Report - Option 4

If Option 4 is exercised by the government in accordance with the Section H clause entitled "Exercise of Option," the contractor shall prepare and submit a draft Final Technical Report by 15 Sep 03 documenting and analyzing the research, testing and developments, and trials conducted under Option 4 in accordance with the Section F clause entitled "Option Deliverables" and Data item A002, Exhibit A. This draft Final Report shall also include a description of all the work conducted under the basic contract, Option 1, and Options 2 and 3 if those two particular options are exercised. The government will have 15 days to comment on the draft Final Report. The contractor shall submit the Final Technical Report by 30 Oct 03, in accordance with the Section F clause entitled "Option Deliverables" and Data Item A002, Exhibit A.

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 11 of 13
Name of Offeror or Contractor: TALKING LIGHTS LLC		

*** END OF NARRATIVE C 002 ***

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 12 of 13
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Name of Offeror or Contractor: TALKING LIGHTS LLC

SECTION F - DELIVERIES OR PERFORMANCE

F.1 DELIVERABLES

F.1 Delivery Address

F.1.1 All hardware and software deliverables shall be delivered FOB Destination to the following address:

Commander
U.S. Army Tank-Automotive Command
ATTN: Mr. Andrew Culkin, AMSTA-TR-E-ELE, MS/21
Warren, MI 48397-5000

F.2.1 Hardware:

F.2.1.1 The contractor shall deliver a complete hardware system including operational and maintenance instructions by 16 Feb 2002.

F.2.1.2 The contractor shall deliver a total of 12 markers by the contract completion date, in accordance with Clause C.4.2.1.

F.2.1.3 The contractor shall deliver an optical receiver, cabling to attach this optical receiver to Pathfinder's Sensor Kit, and software to allow Pathfinder's Navigation Processor the ability to read and process the information being transmitted by the optical network, by the contract completion date, in accordance with Clause C.4.2.2.

F.2.1.4 The contractor shall deliver the software and hardware and the hand-held computers, developed in accordance with Provision C.4.2.4, by the contract completion date.

F.2.1.5 The contractor shall deliver any prototype smart mines, and any hardware and software developed for use with those smart mines, by the contract completion date in accordance with Provision C.4.2.5

F.2.1.7 The contractor shall deliver at least two (2) miniaturized Linear Smart Markers (LSMs) and one (1) Corner Smart Marker (CSM) by the contract completion date, in accordance with Clause C.8.4.

F.2.2 Data

F.2.2.1 All data items required under this contract shall be delivered FOB Destination in accordance with the contract Data Requirements List (DD Form 1423), Exhibit A, to the address listed in F.1.1 above.

F.2.2.2 DELETED

F.2.2.3 The contractor shall submit Progress Status and Management reports every sixty (60) days beginning on 13 Jan 2000, in accordance with CDRL A001. The contractor may submit one combined progress report which describes the status of work under the basic contract, Option 1, and under any other option (Option 2, Option 3 or Option 4) which has been exercised by the government in accordance with the Section H clause entitled "Exercise of Option".

F.2.2.4 The contractor shall submit a draft Final Technical Report, by 45 days before the contract completion date, in accordance with Data Item A002, Exhibit A. The government will have 15 days to review this draft report and submit comments. The contractor will submit the Final Report on the contract completion date, in accordance with Data Item A002, Exhibit A. The contractor will only be required to submit one (1) Final Report which includes the results of the work performed on the basic contract plus the results of the work performed on all options that have been exercised by the government.

F.3 PERIOD OF PERFORMANCE: All work required under this contract shall be completed by 31 May 04.

F.4 OPTION DELIVERABLES

F.4.1 Option 1

The contractor shall provide the following deliverables under Option 1:

a) The contractor shall provide progress reports every 60 days in accordance with Clause C.5.2 and Data Item A001, Exhibit A.

d) If no other option is exercised except for Option 1, the contractor shall provide a draft Final Technical Report by 2 Jan 03, in accordance with Clause C.5.3 and Data Item A002, Exhibit A, 45 days before the completion date of Option 1. This draft Final Report will include the results of all work performed under the basic contract and under Option 1. However, if any other option or options are exercised under this contract the Final Report for Option 1 will be submitted 45 days from the date of contract completion, together with the Final Reports for the basic contract and any other options that have been exercised so that only one Final Report is

CONTINUATION SHEET	Reference No. of Document Being Continued PIIN/SIIN DAAE07-99-C-L068 MOD/AMD P00008	Page 13 of 13
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Name of Offeror or Contractor: TALKING LIGHTS LLC

submitted for all the work accomplished under the contract. The government will have 15 days to review this draft Final Report and provide comments. The contractor shall submit a Final Technical Report for the work performed under Option 1 by the contract completion date in accordance with C.5.3 and Data Item A002, Exhibit A.

F.4.2 Option 2

If Option 2 is exercised by the government in accordance with the Section H clause entitled "Exercise of Option" the contractor shall provide the following deliverables to the government:

- a) The enhanced software and hardware stated in Clause C.6.1 by 16 Sep 03, in accordance with Data Item A003, Exhibit A.
- b) The contractor shall provide Progress Reports under Option 2 in accordance with Clause C.6.2 and Data Item A001, in Exhibit A. These progress reports may be combined with the progress reports due under the basic contract, due under Option 1 and due under Option 3 (if Option 3 is exercised by the government) into one combined report.
- b) The contractor shall submit a draft Final Technical Report by 1 Aug 03, in accordance with Clauses C.6.3 and Data Item A002, Exhibit A. This draft Final Report will include all the work done under the basic contract and all the work performed under any options that may have been exercised, including Option 2. The government will have 15 days to review the draft Final Report and provide comments. The contractor shall submit the Final Technical Report by 16 Sep 03, in accordance with Clauses C.6.3 and Data Item A002, Exhibit A. This draft Final Report shall include all the work performed under the basic contract and all the work done under any options that have been exercised, including Option 2, so that there will only be one Final Report for all the work accomplished under the contract.

F.4.3 Option 3

If Option 3 is exercised by the government in accordance with the Section H clause entitled "Exercise of Option" the contractor shall provide the following deliverables to the government:

- a) The contractor shall deliver the software deliverables described in C.7.2 to the government by 16 Sep 03
- b) The contractor shall provide to the government every 60 days the Progress Reports described in C.7.3, in accordance with Data Item A001, Exhibit A.
- c) The contractor shall provide to the government by 16 Sep 03 a Final Technical Report, in accordance with C.7.4 and Data Item A002, Exhibit A. This draft Final Report shall include all the work done under the basic contract and all the work done under any of the options that have been exercised by the government, including Option 3 so that only one Final Report which includes all the work accomplished under the contract will be submitted. The government will have 15 days to review the draft report and provide comments. The Final Report for the entire contract, including Option 3, shall be submitted by 16 Sep 03.

F.4.2 Option 4

If Option 4 is exercised by the government in accordance with the Section H clause entitled "Exercise of Option" the contractor shall provide the following deliverables to the government by 30 Oct 03:

- a) The contractor shall deliver at least six (6) additional LSMS and three (3) additional CSMS by the contract completion date in accordance with Clause C.9.3.
- b) The contractor shall provide Progress Reports every 60 days in accordance with Clause C.9.3.
- c) The contractor shall provide a Final Technical Report by 30 Oct 03, in accordance with Clause C.9.3.